

Serial No.: 09/680,726
Avago Docket No.: 10004229-1
PATENT

CLAIM AMENDMENTS

Please amend the claims (~~strikethrough~~ indicating deletion and underline indicating insertion) as follows:

Claim 1 (cancelled)

Claim 2 (cancelled)

Claim 3 (currently amended):

3. A vertical cavity surface-emitting laser comprising:
 - a device structure, having a height z and an aperture, including
 - an active layer having an upper and lower surface, and
 - upper and lower distributed Bragg reflectors on the upper and lower surfaces of the active layer and adjacent thereto;
 - a layer having a ~~non-planar~~ textured surface within the device structure, positioned at height x , where $0 \leq x < z$, ~~between heights x and z~~ ;
 - contacts for applying a voltage across the active region;
 - a light emission property that varies within the aperture, wherein the light emission property enables higher order spatial modes; and
 - wherein the ~~a~~ refractive index that varies in the plane perpendicular to light output and the light output is in spatially fixed modes.

Claim 4 (original):

4. A vertical cavity surface-emitting laser, as defined in claim 3, wherein the refractive index has a lengthscale on the order of the lasing wavelength.

Claim 5 (original):

5. A vertical cavity surface-emitting laser, as defined in claim 3, further comprising a substrate having a first side adjacent to the lower distributed Bragg reflector.

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Claim 6 (currently amended):

6. A vertical cavity surface-emitting laser, as defined in claim 5, ~~further including a texturing layer interposing wherein the layer having a textured surface further comprises a texturing layer interposed between~~ the substrate and the device structure, ~~wherein the non-planar layer is the texturing layer.~~

Claim 7 (original):

7. A vertical cavity surface-emitting laser, as defined in claim 6, wherein the texturing layer is patterned.

Claim 8 (original):

8. A vertical cavity surface-emitting laser, as defined in claim 5, wherein the non-planar layer is a layer within at least one of the upper and lower distributed Bragg reflectors.

Claim 9 (original):

9. A vertical cavity surface-emitting laser, as defined in claim 5, wherein the layer within at least one of the upper and lower distributed Bragg reflectors is patterned.

Claim 10 (currently amended):

10. A vertical cavity surface-emitting laser, as defined in claim 5, wherein the non-planar layer is a first surface of the substrate adjacent the lower Bragg reflector.

Claim 11 (original):

11. A vertical cavity surface-emitting laser, as defined in claim 10, wherein the first surface is patterned.

Claim 12 (previously presented):

12. A vertical cavity surface-emitting laser, as defined in claim 5, wherein the non-planar layer introduces a phase mismatch in the device structure.

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Claim 13 (original):

13. A vertical cavity surface-emitting laser, as defined in claim 12, wherein the non-planar layer is a layer within at least one of the upper and lower distributed Bragg reflectors.

Claim 14 (original):

14. A vertical cavity surface-emitting laser, as defined in claim 13, wherein the layer within at least one of the upper and lower distributed Bragg reflectors is patterned.

Claim 15 (previously presented):

15. A vertical cavity surface-emitting laser, as defined in claim 5, further comprising a planarizing plane within the device structure, positioned at height y, where $x < y < z$.

Claim 16 (original):

16. A vertical cavity surface-emitting laser, as defined in claim 15, between heights x and y, the refractive index varies in the plane perpendicular to the light output.

Claim 17 (original):

17. A vertical cavity surface-emitting laser, as defined in claim 15, wherein the refractive index has a lengthscale on the order of the lasing wavelength.

Claim 18 (original):

18. A vertical cavity surface-emitting laser, as defined in claim 15, further comprising a substrate having a first surface adjacent to the lower distributed Bragg reflector.

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Claim 19 (original):

19. A vertical cavity surface-emitting laser, as defined in claim 18, further including a texturing layer interposing the substrate and the device structure, wherein the non-planar layer is the texturing layer.

Claim 20 (original):

20. A vertical cavity surface-emitting laser, as defined in claim 19, wherein the texturing layer is patterned.

Claim 21 (original):

21. A vertical cavity surface-emitting laser, as defined in claim 19, wherein the non-planar layer is a layer within at least one of the upper and lower distributed Bragg reflectors.

Claim 22 (original):

22. A vertical cavity surface-emitting laser, as defined in claim 18, wherein the layer within at least one of the upper and lower distributed Bragg reflectors is patterned.

Claim 23 (currently amended):

23. A vertical cavity surface-emitting laser, as defined in claim 18, wherein the non-planar layer is a first surface of the substrate adjacent the lower Bragg reflector.

Claim 24 (original):

24. A vertical cavity surface-emitting laser, as defined in claim 23, wherein the first surface is patterned.

Claim 25 (original):

25. A vertical cavity surface-emitting laser, as defined in claim 15, wherein the non-planar layer introduces a phase mismatch in the device structure.

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Claim 26 (original):

26. A vertical cavity surface-emitting laser, as defined in claim 25, wherein the non-planar layer is a layer within at least one of the upper and lower distributed Bragg reflectors.

Claim 27 (original):

27. A vertical cavity surface-emitting laser, as defined in claim 25, wherein the layer within at least one of the upper and lower distributed Bragg reflectors is patterned.

Claim 28 (previously presented):

28. A method for manufacturing a vertical cavity surface emitting laser comprising the steps of:

preparing a substrate such that there is a layer having a textured surface having a light emission property that varies within the aperture, wherein the light emission property enables higher order spatial modes;

depositing a lower distributed Bragg reflector;

depositing an active layer;

depositing an upper distributed Bragg reflector; and

fabricating electrical contacts for applying a voltage across the active layer.

Claim 29 (original):

29. A method for manufacturing a vertical cavity surface emitting laser, as defined in claim 28, further comprising the step of removing the substrate after the step of fabricating electrical contacts.

Claim 30 (currently amended):

30. A method for manufacturing a vertical cavity surface emitting laser comprising the steps of:

depositing a lower distributed Bragg reflector having a layer having a textured surface having a light emission property that varies within the aperture ~~and~~ aperture,

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wherein the light emission property enables higher order spatial modes; and;
depositing an active layer;
depositing an upper distributed Bragg reflector; and
fabricating electrical contacts for applying a voltage across the active layer.

Claim 31 (currently amended):

31. A method for manufacturing a vertical cavity surface emitting layer comprising the steps of:
depositing a lower distributed Bragg reflector;
depositing an active layer having a layer having a textured surface having a light emission property that varies within the aperture aperture, wherein the light emission property enables higher order spatial modes; and;
depositing an upper distributed Bragg reflector; and
fabricating electrical contacts for applying a voltage across the active layer.

Claim 32 (currently amended):

32. A method for manufacturing a vertical cavity surface emitting layer comprising the steps of:
depositing a lower distributed Bragg reflector;
depositing an active layer;
depositing an upper distributed Bragg reflector having a layer having a textured surface having a light emission property that varies within the aperture aperture, wherein the light emission property enables higher order spatial modes; and; and
fabricating electrical contacts for applying a voltage across the active layer.